DOCUMENT RESUME

ED 157 586 JC 780 430

AUTHOR Williams, Richard W.
TITLE Facilitating Learning in Mathematics 111: A Holistic Approach.
PUB DATE 78
NOTE 103p.; Ed.D. Dissertation, Nova University

EDRS PRICE MF-$0.83 HC-$6.01 Plus Postage.
DESCRIPTORS Algebra; *College Mathematics; Community Colleges; Comparative Analysis; Conventional Instruction; Educational Interest; Educational Strategies; Experimental Teaching; *Instructional Innovation; *Junior Colleges; *Student Attitudes; Student Motivation; Student Teacher Relationship; Tutorial Programs
IDENTIFIERS Malcolm X Community College IL

ABSTRACT

Two classes of Mathematics 111 students at Malcolm X College participated in a study to test and evaluate a holistic instructional delivery system intended to significantly increase students' achievement scores, retention rate, and positive attitudes toward instruction. The 29 member control group received traditional instruction, while 29 students were taught using a holistic approach that included mandatory attendance at weekly math workshops, non-graded formative evaluation quizzes to assist students and their instructor in identifying learning weaknesses and strengths, and peer tutoring. At the end of the eighteen-week semester, students (both groups) responded to a questionnaire assessing attitudes toward instruction. In addition, student achievement and retention were computed and analyzed. Findings indicated students in the holistic program earned significantly higher achievement scores and had significantly higher positive attitudes toward instruction than the control group. However, there was no statistically significant difference between the proportion of students retained in experimental and control groups. A review of related literature, some problems encountered in developing and utilizing the holistic approach, and strategies for diffusion, implementation, and change are discussed. A bibliography and a copy of the study instrument are included. (Author/TR)

****
* Reproductions supplied by EDRS are the best that can be made *
* from the original document. *
****

"PERMISSION TO REPRODUCE THIS MATERIAL HAS BEEN GRANTED BY

Richard W. Williams

TO THE EDUCATIONAL RESOURCES INFORMATION CENTER (ERIC) AND USERS OF THE ERIC SYSTEM."

U.S. DEPARTMENT OF HEALTH, EDUCATION & WELFARE
NATIONAL INSTITUTE OF EDUCATION

THIS DOCUMENT HAS BEEN REPRODUCED EXACTLY AS RECEIVED FROM THE PERSON OR ORGANIZATION ORIGINATING IT. POINTS OF VIEW OR OPINIONS STATED DO NOT NECESSARILY REPRESENT OFFICIAL NATIONAL INSTITUTE OF EDUCATION POSITION OR POLICY

ED157586

FACILITATING LEARNING IN MATHEMATICS 111: A HOLISTIC APPROACH

Richard W. Williams

A MAJOR APPLIED RESEARCH PROJECT
PRESENTED IN PARTIAL FULFILLMENT
OF THE REQUIREMENTS FOR THE DEGREE
OF DOCTOR OF EDUCATION

NOVA UNIVERSITY

1978

JC 780 430

ACKNOWLEDGEMENTS

The writer wishes to extend his gratitude to the individuals whose more than generous assistance made this study possible. First, I would like to thank my official MARP advisors, Drs. Guerin Fischer, John Roueche, John Scigliano, and Leland Medsker for assistance, and suggestions in the improvement of this document. Special recognition is due Drs. Fischer and Roueche for helping the writer to understand the importance of the student-teacher relationship in facilitating student learning and for genuinely caring about the growth of human beings to the extent that they did everything humanly possible to assist the writer in completing this project. In addition, the writer would like to thank his unofficial advisors, Dr. Dale Tillery, Mr. Dan Davis, Mrs. Vera Nash, Mrs. Lillian Butler, Mr. Bernard Powers, and Mrs. Helen Mitchell for the contributions they made to the writing of the final manuscript.

Secondly, sincere appreciation is extended to the tutors and students who participated in this study. In particular, the tutors, Cynthia Morgan, Leonard Hester, Kevin White, and Betty Johnson made major contributions. In fact, the successes of this research are a reflection of their hard work, dedication, and concern for helping students master mathematics.

Finally, the writer must thank his wife, Dr. Katherine Williams, for being a constant source of inspiration, enthusiasm, and support throughout his tenure at Nova University.

Abstract of a Major Applied Research Project presented to Nova University in Partial Fulfillment of the Requirements for the Degree of Doctor of Education.

FACILITATING LEARNING IN MATHEMATICS 111:

A Holistic Approach

by

Richard W. Williams

July, 1978

The purpose of this study was to design, implement, and evaluate a holistic instructional delivery system that would significantly increase the achievement scores, rate of retention, and positive attitudes toward instruction of students enrolled in Mathematics 111 at Malcolm X College. To fulfill the purpose, a true experimental design was constructed. The subjects were two classes of Mathematics 111 students, 29 in the control group and 32 in the experimental group. The control group was instructed using the traditional method and the experimental group was taught utilizing a holistic approach.

During the final examination week of an 18-week semester, a questionnaire (see Appendix) which assesses students' attitudes toward a specific period of instruction was administered to both the control and experimental groups. At the end of the semester, students' achievement scores,

retention rates, and questionnaire scores were computed and analyzed.

After computing and analyzing the first two hypotheses using an independent Student *t*-test with $p = .05$, it was found that students instructed using a holistic approach earned significantly higher achievement scores (hypothesis 1) and had significantly higher positive attitudes toward instruction than individuals taught in the traditional manner (hypothesis 2). Also, the results of a *z*-test indicated that there was no statistically significant difference between the proportion of students retained in the control and experimental groups (hypothesis 3). Based on these results, it was concluded that holistic instructional strategies may be effective in raising student's achievement levels and improving their attitudes toward instruction.

On the basis of the study's findings and conclusions, it was recommended that:

1. The study should be reviewed, discussed, and evaluated by the mathematics department to determine methods of improving the design and evaluation of Mathematics 111. The design should address both the cognitive and affective needs of students with varying skills and attitudes towards mathematics instruction.

2. Non-graded formative evaluation quizzes, mandatory tutoring sessions, and/or creating the proper learning environment for students should be considered as potentially valuable components in the design of instruction for community college students.

3. Further research should be conducted to determine the effects of holistic instructional strategies in raising the academic achievement levels and attitudes toward instruction of students in the courses during and after the semester in which they were taught using the holistic approach in Mathematics 111. In particular, answers should be sought to the following questions:

a. Will students successfully completing the Mathematics 111 course taught using a holistic approach enroll at a significantly higher rate in a more advanced mathematics course than those individuals who were instructed in the traditional manner?

b. For those individuals who enrolled in a more advanced mathematics course, was the mean grade received significantly related to their exposure to holistic instruction in Mathematics 111?

c. Will the grade point averages of students who were instructed using the holistic approach be significantly higher than individuals taught in the traditional manner?

4. Additional research is needed on the tutoring process and the characteristics of an effective tutor.

5. Research should be performed to determine if there is any significant difference in the achievement scores, rates of retention, and attitudes toward instruction of students instructed using the holistic approach and individuals taught using a modified holistic approach. In the modified holistic approach, the instructor would not participate in the tutoring sessions.

6. Further research should be conducted on the effects of holistic instruction as related to sex, age, ethnic or racial background, socio-economic background, personality variables, initial attitudes toward instruction, varying levels of academic ability, and different grade levels.

7. In order to become more individualized, the holistic approach could be revised to provide students with more choices in behavioral objectives, instructional resources, levels of mastery, and forms of evaluation.

8. In order to increase both internal and external validity, the experiment should be replicated not only in mathematics but in other academic and occupational areas with varying populations.

9. Since the successful implementation of a holistic learning model depends on the time available and the desire of the instructor to accommodate individual differences in students' academic skills and attitudes toward instruction, research should be conducted on the effects of the learning model with different types of instructors. Perhaps this type of research would provide information concerning the instructional delivery system most effective for a particular kind of instructor.

After making recommendations for the improvement of community college instruction, the final topic discussed was methods of assisting the mathematics department at Malcolm X College in redesigning Mathematics 111. To accomplish this goal, the need for holistic instruction and the results of this study will be discussed with each member of the mathematics faculty. The results will also be presented to the appropriate administrators, the mathematics curriculum development committee, interested colleagues, administrators, classified staff, and members of the Board of Trustees of the Chicago City Colleges. In addition, a copy of the completed study will be placed on reserve in the Malcolm X College library.

Another reason for conducting this research was to improve educational practices in general. In this case, the completed study will be submitted to the ERIC Clearinghouse for Junior Colleges. In addition, several articles discussing the various aspects of this investigation will be submitted to the Community and Junior College Journal and Improving College and University Teaching. Community college instructors and anyone else who expresses an interest in holistic instruction will receive copies of whatever information is desired.

In the process of designing, implementing, and evaluating a holistic instructional delivery system, several members of the mathematics department have shown a great deal of interest in the concept of holistic instruction and the results of this study. These individuals have indicated that they will implement and evaluate some of the instructional strategies and learning activities utilized in this study. At this point, no one has made a commitment to implement the entire system because of the time an instructor must devote to tutoring students. However, to eliminate this problem, the instructor who taught the control and experimental groups in this study will design, implement, evaluate, and teach a course in the Fall of 1978 to train tutors to assist instructors in Mathematics 111 courses at the college.

It is hoped that the results of this study and the discussion of these results will help community college instructors realize that if attending a community college is to be a meaningful educational experience for students, an effective, caring, well-

informed, and capable teaching staff is essential. Since a number of students enroll in community colleges with negative attitudes toward instruction, it is the responsibility of the college to assist these students in developing the basic skills and attitudes needed to facilitate their academic and personal growth.

Colleges should be accountable for student learning and development. The faculty and administrators must be concerned with developing innovative strategies to improve instruction and student attitudes. Colleges cannot totally depend on the universities to develop effective models for learning. Instructors must design, implement, and evaluate nontraditional instructional delivery systems to facilitate student learning. They must make every effort to ensure that the "open door" is not a "revolving door" for students. They must believe that students can learn if given enough time and direction.

TABLE OF CONTENTS

Page

LIST OF TABLES xii

Chapter

1. INTRODUCTION 1

Background and Significance 1
Research Questions 5
Hypotheses 6
Definition of Terms 7
Assumptions 9
Limitations 10

2. REVIEW OF RELATED LITERATURE 11

Introduction 11
Improving Student Achievement and Retention 17
Students' Attitudes Toward Instruction 29
Systematic Design of Instruction 33

3. PROCEDURES AND METHODOLOGY 38

Procedures for Collecting Data 38
Procedures for Treating Data 40
Instructional Procedures 41

4. FINDINGS 46

Preliminary Comparison of Control and Experimental Groups 46
Hypothesis One 47
Hypothesis Two 52
Hypothesis Three 54
Relationship between Holistic Instructional Strategies 57

5. SUMMARY AND CONCLUSIONS 63

Summary of Findings 63
Conclusions 68
Recommendations 70
Strategies for Diffusion, Implementation and Change 74

TABLE OF CONTENTS

Page

REFERENCE NOTES..... 77

REFERENCES..... 78

APPENDIX..... 86

Questionnaire..... 87

LIST OF TABLES

Table		Page
1.	Demographic Characteristics of Experimental and Control Groups	47
2.	Comparison of Mean Achievement Scores of Experimental and Control Groups	48
3.	Comparison of Mean Questionnaire Scores of Experimental and Control Groups	52
4.	Comparison of Experimental and Control Groups Responses to Questions One, Three, and Forty-three on the Instruction Attitude Inventory	54
5.	Comparison of Experimental and Control Groups Rate of Retention	55

Chapter 1

INTRODUCTION

Background and Significance

A number of community college educators insist that there is a need for new instructional strategies to improve the achievement, retention, and attitudes of students. Roueche, Herrscher, and Baker (1976) are among these. They believed that the community college needed to modify its traditional instructional techniques to accommodate the low-aptitide student. Herrscher (1973) reported that research indicated the traditional lecture method tended to be ineffective with nontraditional students. Roueche and Pitman (1972) emphasized that the traditional method has not met the needs of the community college student. Roueche and Snow (1977) and Ostrowski (1976) added that the teacher-dominated classroom and the typical outmoded curriculum caused increased student attrition, decreased achievement, and negative attitudes toward instruction.

Past and present research in the mathematics department at Malcolm X College (MXC) corroborated Roueche and Snow's and Ostrowski's findings. The traditional lecture method has been unsuccessful in promoting student achievement, retention, and in developing positive attitudes in learners. The faculty is concerned with this problem and feels that nontraditional modes of instruction must be explored to ensure that the institution provides more effective services for students. In

addition, a number of instructors believe the present community colleges' organizational structures and instructional strategies must be redesigned to satisfy the needs of students rather than faculty. This viewpoint was supported by Richardson, Blocker, and Bender (1972), Tillery (1970), Medsker and Tillery (1971), and Roueche and Snow (1977). Roueche and Roueche (1977) further contended that it was the responsibility of each instructor to critically evaluate his own instructional design and delivery system in order to promote competencies in all students.

Based on the review of the literature and the concerns of the faculty of Malcolm X College, the purpose of this study was to design, implement, and evaluate a holistic instructional delivery system that would significantly increase the achievement scores, retention rates, and attitudes toward instruction of students enrolled in Mathematics 111. It was hoped that this study would begin to answer various questions that professors have regarding the methods necessary for facilitating student learning. It was also anticipated that the study would stimulate faculty, administrators, and board members into taking seriously the notion that the college exists to facilitate the academic and personal growth of students.

After investigating the literature on the instructional strategies needed for facilitating student learning, it was clear that four major issues involving the experimental group would affect the results of this study. The first was the

instructor's ability to identify a form of evaluation which provided immediate and on-going information concerning the learning needs of the student. Airasian (1969) suggested the use of formative evaluation. Formative evaluation identified learning weaknesses prior to the completion of a lesson, unit, or chapter (Block, 1971, p. 79). However, in order to provide continuous formative evaluation, all objectives in a unit, lesson, or chapter must be evaluated (Airasian, 1971, p. 82).

The second issue was the extent to which students could be motivated to correct their learning difficulties and what learning correctives should be used to supplement instructional procedures. Bloom's (1974) general appraisal of work done to this point implied that a student-buddy system (or providing opportunities for small groups to work together) was an effective method to motivate students to correct their problems. Block (1971, p.71) also identified several correctives which were effective:

1. Small group problem sessions
2. Individual tutoring
3. Alternative learning materials
4. Alternative textbooks
5. Workshops and programmed instruction
6. Audio-visual materials
7. Academic games and puzzles
8. Reteaching

The third issue was the instructors ability to provide the additional instructional and human resources to assist students. To provide additional instructional support for students, attendance at a weekly half-hour mathematics workshop was mandatory for all learners. In these sessions, the instructor, peer tutors, and a paraprofessional provided tutorial assistance. The purpose of these workshops was to identify and aid students in obtaining competency in any objectives or unit examinations not mastered. Also, a recycling process was used to inform the learner of all additional opportunities he or she had to achieve competency at the desired level.

The final issue was the grading system. The formative evaluation quizzes were not graded, thus all students had as many opportunities as needed to achieve competency. The unit examinations were graded by using an absolute grading system. Also, if a student did not pass any initial unit examination, he or she was given the opportunity to recycle any problems or objectives not mastered on that examination. Note here that all initial unit examinations were worth 120 points, and a unit examination that was recycled, or that was not written on the announced day it was given was worth 80 points. This policy was adopted to provide incentive for students to recycle examinations and to curtail student procrastination. It must also be noted that once a student recycled any unit examination and achieved a passing grade, the recycled examin-

ation was officially recorded, not the initial test score.

It was hoped that this study would have several implications with regard to community college educational practices in general and Malcolm X College in particular. The first implication was that instructors would realize that students learned when they were taught by a professor that was willing to develop materials, accommodate individual differences, and create the proper environment for learning. The second implication was that students would begin to believe that they were gifted individuals with untapped talents that can assist them in leading a much fuller life than they are currently experiencing. Based on these implications, this study may be the catalyst needed to revitalize professors' interest in teaching, which in turn should improve the services provided for students.

The exploration of the critical issues pertaining to facilitating student learning and its implications for community college education led to three questions which this study sought to answer, and several hypotheses which were tested.

Research Questions

The three research questions were:

1. Would students in Mathematics 111 instructed using a holistic instruction approach have significantly higher mean achievement scores than students taught in the traditional manner?

2. Would students in Mathematics 111 instructed using a holistic instructional approach have significantly higher positive attitudes toward instruction than the group taught in the traditional manner?

3. Would students in Mathematics 111 instructed using a holistic instructional approach have a significantly higher rate of retention than the group taught in the traditional manner?

Hypotheses

Based on the findings of Roueche and Snow (1977), Roueche and Mink (1976a) and Roueche (1976a), the following hypotheses were tested:

Null Hypotheses

1. Students instructed in Mathematics 111 using a holistic instructional delivery system would not have significantly higher mean achievement scores than the group taught in the traditional manner.

2. Students instructed in Mathematics 111 using a holistic instructional delivery system would not have significantly higher positive attitudes toward instruction than those taught in the traditional manner.

3. Students instructed in Mathematics 111 using a holistic instructional delivery system would not have a significantly high-

er rate of retention than those taught in the traditional manner.

Alternative hypotheses

1. Students instructed in Mathematics 111 using a holistic instructional delivery system would have significantly higher mean achievement scores than those taught in the traditional manner.

2. Students instructed in Mathematics 111 using a holistic instructional delivery system would have significantly higher positive attitudes toward instruction than those taught in the traditional manner.

3. Students instructed in Mathematics 111 using a holistic instructional delivery system would have a significantly higher rate of retention than those taught in the traditional manner.

Definition of Terms

To facilitate the reading of this study, the following terms were defined:

Absolute grading system - a method of student evaluation based solely on an individual's performance in a given subject regardless of the achievements of others in the group.

Achievement - A student's final examination score in Mathematics 111. This variable was measured by computing the student's mean test score on five unit examinations.

Attitude - "A general disposition to regard something in a positive or negative way (Bloom, 1971, p.20)."

Attitude toward instruction - An individual's general disposition to regard the instructor, the learning activities, and the subject matter in a positive or negative way. This variable was measured by a questionnaire (see Appendix).

Competency-based instruction - A teaching method that "requires students to demonstrate in the classroom the kinds of skills, knowledges, and other abilities required of them at some later time: in a later course, or on the job following graduation. Time is the variable and achievement is the constant (Roueche, et al, 1976, p.43)."

Holistic instruction - A systematic teaching method that structured student success. The delivery system incorporated the concepts of competency-based instruction with the theories of the humanists who believe that learning should occur in an accepting, loving, and caring environment in which an individual can realize his or her full potential without threat or embarassment.

Mathematics 103 - Freshman algebra course that began with an introduction to arithmetic and developed algebraic concepts through systems of linear equations.

Mathematics 111 - Freshman algebra course that began with an introduction to sets and developed algebraic concepts through systems of linear equations.

Negative attitude toward instruction - A characteristic of a student that would not engage in a learning task or series of learning tasks, if free to make a choice. This variable was measured by a questionnaire.

Positive attitude toward instruction - A characteristic of a student that would voluntarily engage in a learning task or series of learning tasks, if free to make a choice. This variable was measured by a questionnaire.

Recycling - A method used to inform the learner of any additional opportunities he or she had to achieve selected objectives in the event he or she did not achieve competency on the first post-assessment.

Retention - The ability to maintain student attendance in Mathematics 111 throughout the entire semester. This variable was measured by the proportion of students attending 35 out of a total of 52 class days with no more than six consecutive sessions absent.

Traditional Instruction - A teaching method that required students to operate within a specified time limit. The criteria of success was a letter grade which indicated the extent to which the student knew the required subject matter. It did not make provisions for students to achieve at their own rate.

Assumptions

For the purpose of this investigation, it was assumed that:

1. The Pennsylvania State University Instruction Attitude Inventory developed and evaluated by Finch (1969) was valid and reliable.
2. The data derived from the instrument were accurate.
3. The experimental and control groups were representative of the total population.

Limitations

To assist the reader in interpreting the findings, the limitations of the study were:

1. Range of the study was limited to one school, Malcolm X College, and two classes out of a total of eight Mathematics 111 sections.
2. One teacher taught both the experimental and control groups, which affected external validity (Tuckman, 1972, p.97).
3. The study was conducted over one academic semester of 18 weeks.
4. The questionnaire used in the study contained only 43 out of the 47 items listed on the Pennsylvania State University Instruction Attitude Inventory.

Chapter 2

REVIEW OF RELATED LITERATURE

Introduction

The initial step taken in designing a holistic delivery system was to review the literature focusing on the improvement of community college instruction. Roueche and Snow (1977) reported that many instructors, counselors, and administrators recognized that effective educational experiences must move away from merely mechanical approaches to skill development and realize the importance of self-concept development in student learning. Roueche and Snow (1977, p.129) added that "developmental programs must be holistic in design and implementation if the real student problems are to be addressed."

Roueche and Snow asserted explicitly that the teacher is the key to the design and implementation of an effective program for students. This viewpoint was supported by Bloom (1968), Moore (1976), Cross (1976), Gordon and Wilkerson (1966), and Roueche and Kirk (1973). Roueche and Snow (1977) added that the teacher's role was essential since the teacher must make three crucial decisions.

First, the teacher decided what was to be learned. Roueche and Snow (1977) pointed out that content selection can be a powerful incentive for student motivation and signif-

icant learning. They insisted that content must have perceived practical utility or it must be of interest to the student. Thus, if learners understand that the content was useful or related to their own interests, they would be more responsive in their attempts to learn the material.

The second decision was how the subject matter was taught. Roueche and Mink (1976a) documented that an individual learner-oriented instructional system was the most appropriate method for helping community college students with academic deficiencies and negative attitudes toward education. Roueche and Snow (1977, p.117) defined individual learner-oriented instruction as a method of learning that was geared to the present capabilities of each student. They added that "high-risk students are staying in school with high retention rates, good achievement, and most important, new perceptions that they can succeed in college" when taught using an individualized instruction system.

Individualized instruction was associated with Bloom's mastery-learning concept. Utilizing Bloom's theory, the criteria for determining performance standards must be clear and objective. Each student should be evaluated against performance criteria, and student performances must never be compared. In other words, criterion performance, not time, was the most important factor (Roueche and Snow, 1977).

Roueche et al. (1976) mentioned that competency-based instruction (CBI) was based on Bloom's mastery learning

concepts and the theories of Carroll. Bloom (1968) believed that given enough time and assistance, 95 per cent of our students could learn a subject at a high degree of mastery. The Carroll (1963, p.729) model for learning involved five elements--three stemmed within the individual and two originated from external factors. Carroll stated:

> The factors in the individual are (1) aptitude--the amount of instruction needed to learn the task under optimal instructional conditions, (2) ability to understand instruction, and (3) perseverance--the amount of time the learner is willing to engage actively in learning. Factors in external conditions are (4) opportunity--time allowed for learning, and (5) quality of instruction--a measure of the degree to which instruction is presented so that it will not require additional time for mastery beyond that required in view of aptitude.

Rouechc et al. (1976) added that CBI was designed to give students the kinds of skills, knowledge, and other abilities that they would use at some later time. Oriented toward success rather than failure, it guaranteed that most of the students attained a specific level of skill. This level of skill concept was the major difference between CBI and the traditional method in that the former designed courses which were systemically linked together by a family of observable skills and created programs which were more specific and explicit. In this system, the competencies of students were agreed upon in advance, they provided a firm foundation for the next program of instruction or job performance, and the learning activities and related instructional strategies were designed to help

students acquire and demonstrate specific outcomes.

The systematic design of instruction was linked to the mastery learning concept and has been identified with individualized instruction (Roueche and Snow, 1977, p.100). Cross (1976, p.52) confirmed that all methods of individualized instruction began with five basic principles that are widely accepted today as essential ingredients for effective learning. These were: (1) The learner was active not passive. (2) The goals of learning were made clear to the student. (3) Small units were sequential and dealt with a single concept. (4) Effective learning requires feedback and evaluation. (5) Self-pacing was used to make provisions for individual differences. Cobb (Note 1), Gallup (Note 2), Mink and Watts (Note 3), and McMichael and Corey (1969) contended that individualized instruction improved the grades of high-risk students, and Roueche and Mink (1976a) and Roueche and Pitman (1972) documented that it increased academic achievement, motivation, skills, and persistence.

In addition to deciding what was learned and how it was taught, Roueche and Snow (1977) reported that the third crucial decision that the teacher must make was what the learning environment should be. They are convinced that when teachers encouraged cooperation and utilized positive reinforcement, they created an environment conducive to meeting the academic and personal growth needs of all students.

They recommended several ways in which teachers can create

a learning environment. First, teachers must become involved with students. The initial step in becoming involved was knowing the name of every student by the end of the first week of school. Learning students' names communicated to them that the teacher was interested in them as human beings. In fact, Roueche (1976a) felt that in order to get students to cooperate and become involved in the learning process they must believe that they are OK as human beings. In addition, Roueche and Mink (1976a) reported that there are significant relationships between the time that teachers are willing to spend early in the semester in getting involved with students and the amount of content these students mastered in the semester.

In addition to student involvement, teachers must communicate expectations daily by classroom behavior. Daily expectations are communicated by (1) trying to involve all students in discussions--not just bright ones; or (2) by teachers not avoiding direct contact with certain students (Roueche and Snow, 1977).

A third way in which teachers created the proper learning environment was by caring. Roueche and Snow (1977, p.121) define caring as the "daily behavicr that communicates to students how the teacher really feels about them." Roueche and Snow (1977, p.119) note that teachers willing to develop materials, specify objectives, and accommodate individual differnences indicated to their students that they cared about them to the

extent that they were willing to make extra efforts to ensure that they succeed. Cross (1976) added that the humanists such as Carl Rogers, Stanley Hall, and Abraham Maslow supported the development of a total campus environment that was accepting, loving, and caring in order to facilitate student learning.

Another way for teachers to show that they care was by daily monitoring student achievement. Roueche (1976a) proprosed that daily monitoring was one way of finding out when students are confused, and being able to help them at the moment of confusion was the best method for eliminating the problem.

Several educators corroborated Roueche and Snow's (1977) findings and added that the teachers expectations of the students chances of success will probably be the key factor in designing an environment conducive to learning. Bloom (1968), Bloom, Hastings and Madaus (1971), Rosenthal (1968), Rosenthal and Jacobson (1968), Roueche (1968), Roueche (1973), and Moore (1970) all agreed that teachers' expectations may be the most important factor of student achievement in the classroom. They believed that students or less knowing individuals have a tendency to perform to the level expected of them by authority figures. In fact, Canfield (1968, p.69) documented that 25 per cent of the students in any class and in any course failed if the teacher thought that they were not capable of succeeding. Zigler (cited in Tavris, 1976, p.74) added that

"The commitment to do something makes the difference. Once a kid sees that you're doing something--and you feel like you are doing something--things happen. What will do kids in is the attitude that nothing works."

Improving Student Achievement and Retention

Community college students can learn. This statement is based on a systematic review of the literature which indicated that four methods seem to be effective in improving student achievement and retention. These methods were mastery learning, counseling, tutoring, and institutional climate.

Mastery Learning

In a speech given at the American Educational Research Association Convention in 1971, Bloom (Note 4) reported that with sufficient effort, care, and use of the mastery learning concept, we can approach a vanishing point in individual differences in school achievement. He revealed that three variables accounted for individual differences in school achievement.

The first was entry behavior. Entry behavior was defined as the prerequisite learning that was required if the student is to attain mastery of the task. Bloom thought that it was impossible for a learner to achieve mastery if he did not possess the necessary entry behaviors. However, it was possible to alter the learning task so that each alteration required

different entry behaviors.

The second was affective entry characteristics. Affective entry characteristics were regarded as a combination of interests and attitudes toward the learning tasks, attitudes toward school and schooling, as well as deep-seated self-concept and personality characteristics. If the learner had negative entry characteristics, it would be very difficult, but not impossible for him or her to achieve mastery of a specific learning task. Operationally, Bloom declared that there must be an openness to the new learning task, a willingness to make the effort required, and hopefully enough self-confidence to overcome real or imagined obstacles.

Bloom reviewed a number of studies on interest, attitudes, self-concept, and motivation as related to school learning. Based on this review, he argued that students must acquire positive affective entry characteristics before entering subsequent learning tasks. Also, he noted that affective entry characteristics were perceptual phenomena rising from the student's perception of how well he was learning and that this was usually based on the evidence and judgements he received from teachers, parents, and peers.

The final variable was quality of instruction. The specific aspects of this variable were derived from observing a good tutor teaching one student. It was observed that a good tutor used a variety of cues to make clear what was to be learned, what the student's assignments were, and what method

he must use. Also, the tutor motivated the learner to actively participate in the learning process. Finally, the tutor used a variety of reinforcements or rewards at various stages of the learning process.

So far, quality of instruction has been approached as though we had an ideal tutor with one learner. In group learning, Bloom pointed out that teachers need feedback evidence on the effectiveness of the learning process. They must also make use of corrective procedures when and where they were needed. In other words, he felt the teacher must determine what the student learned as well as what he needed to learn before proceeding to the next learning task.

While a variety of feedback and corrective processes were possible, Bloom (1974, p.5) found that brief diagnostic tests proved to be the most useful. These formative quizzes determined what each student had learned and what he still needed to learn to obtain competency at the desired level. The success or failure of student learning is clearly related to the degree of efficiency of these formative tests in pinpointing the learning needs of the student (Bloom, Hastings, and Madaus, 1971).

However, Bloom (1974) thought the key to student learning largely laid in the extent to which students can be motivated and helped to correct their learning difficulties. His general appraisal of work done so far suggested that developing a student-buddy system, or providing opportunities for small groups to work together was an effective means of motivating students

to correct problems. Teacher aides, programmed instruction, and additional instructional materials appeared to work well in certain situations. In very few cases has the teacher provided the additional instruction or help needed.

In some cases, motivating students may be difficult. According to Bloom (1974, p.8) after a number of years of school failures or low grades, it was difficult for students to gain new confidences in themselves. Only slowly, task by task they learn that they can understand and master the subject. Roueche and Snow (1977, p.117) agreed with Bloom's findings and added that "the only experience which will create an expectancy to succeed is actual success." They recommended that the first learning steps be within the reach of students, so that success is guaranteed. The basic strategy that they were advocating was a systematic approach to instruction, in which learning proceeds from the simple to the complex.

Counseling

Several studies (Roueche and Snow, 1977; Watts, 1974; Mink and Roueche, 1976; McGhee and Crandall, 1968; Nowicki and Roundtree, 1971; Mink, 1976; Snow and Linquist, 1977; and Lee, 1974) indicated that counseling is an effective method to improve student achievement and retention. These studies employed several different strategies. For example, McGhee and Crandall (1968) and Nowicki and Roundtree (1971) used the concept of internal-external locus of control to increase academic achievement. Internal-external locus of control

refers to an individual's perception of contingency relationships between their actions and subsequent outcomes. Individuals who believed that they control the payoffs in life are called "internals." Those who felt that fate, luck, or powerful others control life's payoffs are called "externals" (Roueche and Mink, 1976b). Lee (1974) utilized a different technique. She documented that a special summer session involving skill building and improving motivation appeared to give disadvantaged students a good chance for success in college.

Bednar and Weinberg (1970) synthesized 23 studies from 1927 to 1968 to determine relationships between counseling and academic achievement. They found:

1. Counseling programs lasting for ten hours or more increased academic achievement.

2. Structured rather than unstructured counseling programs affected academic improvement more frequently.

3. Highly dependent students needed a leader structured form of group counseling. While, independent learners functioned better in a low authority group structured setting.

4. Study skills courses combined with counseling helped students to achieve significant academic gains.

In order to corroborate Bednar and Weinberg's findings, Watts (1974) reviewed ten studies on counseling after 1968.

According to Watts, his research supported three of Bednar and Weinberg's findings. They were:

1. Counseling must be more than ten hours to improve academic achievement.

2. Counselees in lengthy and structured programs tended to show significant improvement in academic performance.

3. Group counseling combined with study skills instruction produced significant improvement in academic achievement by counselees.

Educators support the use of a counseling component in the community college. This support was based on the fact that a number of community college students are characterized as being academically unprepared, unmotivated, and deficient in self-confidence (Mink and Watts, 1977). In addition it was reported that community college students:

1. "feel inadequate as human beings, suffer from feelings of rejection, powerlessness, and are convinced that they cannot succeed" (Roueche, 1976b, p. 12)

2. possess "failure identities" (Glaser, 1972).

3. "are characterized by feelings of powerlessness, alienation, inappropriate adaptive behaviors--unrealistic levels of aspiration, lack of problem-solving skills and experience, hostility, agressiveness, and often delinquency" (Roueche and Kirk, 1973, p.69).

If these three statements are correct, then to improve student achievement and retention community colleges must develop "success identities" by using the dual approach of counseling for internality and designing success-oriented programs (Mink and Roueche, 1976). Recall, internality implied that an individual perceived the payoffs in life as being "contingent upon his own behavior or his own relatively permanent characteristics" (Rotter, 1966, p.1).

The assumption that Mink and Roueche (1976) made was that internality goes hand in hand with academic achievement and retention. This was supported by Lessing (1969), Mink and Watts (1977), and Rotter (1966).

Dua (1970), Masters (1970), and Majumder, Friedland, Greever, and Holt (1972) used counseling strategies to develop internality in counselees. However, Glaser's reality therapy model seemed to be the most useful since it contained an element of all the studies to date used for eliciting shifts to internality (Mink and Watts, 1977; Mink and Roueche, 1976).

According to Mink and Roueche (1976, p.13):

> The Glaser model depicts a six-phase process beginning with personal involvement between helpers and helpees (Phase I), moving to focus upon behavior (Phase II), focusing on the payoff (Phase III), calling for value judgement - Is that what you want? (Phase IV), asking for a plan (Phase V), and providing follow-up and replanning if necessary (Phase VI).

Mink and Roueche (1976) added that reality therapy was successful in increasing the retention and academic achievement of students at Camelot Community College and Odessa

College by shifting the learners locus of control.

Although college educators considered counseling to be an effective remedy for improving retention and academic achievement of high-risk students, Moore (1976) found that students have a slightly different viewpoint. Their major complaint was that counselors wanted to spend too much time in one-to-one therapy and too little time in providing information concerning how to survive in college. In other words, students needed and wanted support and information that allowed them to negotiate the academic bureaucracy (Hecht, 1970).

Moore (1976) was not suggesting that personal counseling has no value. Still, he thought that if a student does not have the appropriate information and support needed to be a success in college when he voluntarily withdraws or was officially withdrawn from college, then all we may have is a academic failure who likes himself. Mink and Roueche (1976) added that counselors who wanted to succeed with high-risk students must keep in mind (1) realistic levels of aspirations; (2) seeing oneself as an achiever; (3) having an expectation of success; and (4) having experiences which indicate that an individual controls his or her own payoffs in life--are necessary for students to gain permanent success in society.

Tutoring

Tutoring was the third method used to improve student achievement and retention. However, despite the widespread

use of tutoring, very few studies have been done at the college level (Carman, 1975). Even in those studies done, the effectiveness of tutoring in improving the academic achievement of college students was ambiguous.

Carman (1975), Lucas, Gaither, and Montgomery (1968), Evans (1974);and MacMillan (1971) documented that there was no significant difference in achievement between tutored and non-tutored students. Whereas, Wright (1971) and Taylor (1969) found that tutoring was an effective means for raising achievement levels for many students.

Although the effectiveness of tutoring in improving academic achievement was inconclusive, tutoring appeared to be successful in increasing student retention (Carman, 1975). Adams (1971), Born and Herbert (1971), MacMillan (1971) Sykes (1971), Yuthas (1971), and Snow and Linquist (1977) confirmed Carman's (1975) findings. They all reported that there was a significant difference in retention between tutored and non-tutored individuals.

Roueche and Snow (1977) advised that just recruitment of tutors or peer tutors does not guarantee student success. They verified that programs selecting tutors based on observable and measureable criteria were the most successful. Roueche and Snow (1977, p.96) added that "tutors trained in study skill techniques, in teaching techniques, and especially in self-concept development strategies do contribute to successful programs." Snow and Linquist supported this viewpoint.

Moore (1976) also agreed with Roueche and Snow's (1977) findings; and he added that effective tutoring must be systematic. In order to develop a systematic tutoring program, Moore (1976, p.28) suggested that tutors should:

1. have diagnostic information about students.
2. know the goals of both the course and the student.
3. have access to the same institutional resources as the instructor.
4. meet frequently with the instructor to discuss students' progress.
5. have opportunities to visit the instructor's classroom in order to observe teaching style and method.
6. be able to examine how the instructor constructs tests, grades, and makes assignments.
7. not be excluded from any orientation for the instructional staff which focuses on high-risk students.
8. have course outlines, syllabi, examination schedules, and other pertinent information about the course.

Moore (1976, p.29) went on to say that:

1. an institution should not hire a tutor who exhibits negative attitudes toward high-risk students.

2. tutors must be competent, sensitive, and represent all ethnic groups.

3. tutors are used to supplement not replace classroom instruction.

Institutional Climate

Institutional climate or college environmental factors was the fourth method used to improve student achievement and retention. Roueche and Snow (1977), Pace (1962), Wallberg (1969), Centra and Rock (1971), Thistlewaite (1959), and Moos (1976) insisted that institutional climate had serious effects on student achievement and retention. For these effects to be positive, the learning environment must be designed to guarantee students successful learning experiences (Roueche and Herrscher, 1970; Roueche and Snow, 1977; Rouche and Wheeler, 1973; and O'Banion and Thurston, 1972). In fact Carman (1975) cited the lack of emphasis on environmental factors as probably the reason why many instructional programs are ineffective.

The question now is, how can teachers create such an environment? Roueche and Roueche (1977, p.40) provided a few suggestions. They pointed out that students must feel that the learning environment was designed for their success. They added that students must expect the followings things to occur:

1. They must feel that the instructor is in their corner.

2. They must feel that the person in charge of the classroom activity and the dispensing of skill information is one whose primary job is to take whatever steps necessary to meet their present capabilities.

3. They should have as clear a picture of their task on a day-by-day, month-by-month basis as is possible.

4. They should be informed as to how they will be evaluated for their efforts.

5. They should be thoroughly explained the relevancy of what they are doing.

6. They will not be penalized for the level at which they enter the course; rather, there will be instructional strategies and techniques available that have been designed to address the needs that they bring with them.

7. Most importantly, they should be carefully guided in their day-to-day activities.

Several other writers mentioned slightly different strategies for improving institutional climates for learning. Wilson, Gaff, Dienst, Wood, and Bavry (1976, p.40) maintained that out-of-class interaction with faculty yielded many educational benefits for students. Furthermore, students seemed to thrive on this kind of experience with professors. In fact, students felt that the most educationally significant encounters between students and faculty were the result of close, broad, and continuous relationships.

Centra and Rock (1971, p.629) further substantiated the findings of Wilson et al. (1975). They stated that "students

learn more than might be expected if they feel that instructors are readily accessible, interested in teaching, and interested in students as individuals."

So far, it has been presumed that student-faculty interaction has value for students. However, Wilson et al. (1975, p.43) asserted explicitly that:

> Faculty members who have the most interaction with students also seem to reap personal and educational benefits from such interaction. Out-of-class interaction seems to enhance both the enjoyment and the sense of accomplishment a faculty member can derive from teaching, and it seems to increase his knowledge of students' academic strengths and weaknesses in areas central to college education.

No matter what strategies are utilized to create the proper learning environment, Roueche (1973, p.29) was convinced that:

> The key is caring about other human beings to the point that the teacher is willing to do everything possible to assist them in being successful. Unless the dimension of caring is there, probably no method of instruction is going to be effective.

It has been pointed out that environmental factors influenced student achievement and retention. In addition, Pace (1962) inferred that the institutional climate had serious effects on students attitudes toward instruction.

Students' Attitudes Toward Instruction

Bloom (1971, p.15) contended that each student judged himself against the standards set by himself, the teacher, or

peers. These judgements were made frequently since the school probably stressed competition as the primary technique for motivation. Only rarely were these school judgements based on absolute norms. Bormuth (1970) and Glaser and Nitko (1970) agreed that relative rather than absolute norms were the basis for most school judgements.

Bloom noted that a series of particular learning tasks helped students to secure many judgements of their capabilities to perform these tasks. With public appraisals of their performance, they began to see themselves as highly capable with this type of task, moderate in capability, or low in capability. Since they were given at least one year of a particular task, they were forced to accept some judgement concerning their capability to master this task.

As students' performances and perceptions of their ability to master these tasks accumulated and became more consistent, their motivations for the next tasks became stable. If they viewed their performance as adequate, they approached the next task with confidence and assurance. If their performance was not adequate, the students began to believe in their inadequacy and found little energy to accomplish the next task, and little perseverance when difficulties arose (Atkinson and Feather, 1966).

Bloom (1971) took the position that students' attitudes toward instruction was a perceptual phenomenom based on the judgements they made on their adequacy to perform particular learning tasks. These perceptions had consequences for future

efforts at learning. Success (adequacy) in the subject caused students to choose to learn more tasks of this type. Failure (inadequacy) in the subject caused students to avoid further learning tasks of this type.

Bloom, Hastings, and Madaus (1971, p.56) and Wentling (1973, p.57) confirmed Bloom's findings. Bloom et al. (1971) indicated that students' attitudes toward schooling affected their long-term learning. If students felt that they were doing well in a subject, the subject was opened for further exploration. Conversely, to do poorly closed that area for further voluntary study.

Bloom (1971) also proposed that varying degrees of success (or failure) may be needed for different students to judge themselves as adequate or inadequate. However, he felt that this was only a matter of degree, and that students who accumulated sufficient experiences of success (or failure) would at some point develop positive (or negative) attitudes toward instruction.

Bloom does not believe that a few successful or unsuccessful experiences had a major effect on students self-concept. But given a sufficient number of these experiences, almost every student succumbed to a self-view which was positive (adequate) or negative (inadequate). It was the frequency and consistency of judgements of adequacy or inadequacy over a period of years which had major effects on self-concept.

Carman (1975) and Aiken and Dreger (1961) agreed with

Bloom. They were convinced that a negative self-image influenced the students' expectations of future performance and affected their actual performance in mathematics courses. Aiken (1970) added that mathematics instruction was the target of negative attitudes more than other subjects such as reading and writing.

Since students more often have negative attitudes toward mathematics instruction than other subjects, Alvord (1972) suggested that innovative instructional techniques must be developed which centered on content-related goals as well as the development of positive student attitudes toward instruction. In response to this need, Block (1974) verified that the mastery learning approach to instruction had noticeable effects on students' attitudes and achievement.

A number of studies further substantiated Block's findings. Bloom (1974), Block (1971), Sheppard and MacDermot (1970), and and Roueche and Kirk (1973) emphasized that the mastery learning concept produced positive attitudes toward instruction and raised achievement levels.

To this point it has been reported that it is possible for community colleges to improve student achievement, retention, and attitudes toward instruction through mastery learning, counseling, tutoring, and institutional climate. Next, the systematic design of instruction was considered.

Systematic Design of Instruction

Teaching is vague and general and a systems approach is needed to improve instruction (Roueche and Pitman, 1972). Banathy (1968, p.14) provided a precise definition of systems approach:

> A systems approach to the development of a system offers a decision-making structure and a set of decision-making strategies. It makes available for the designer a self-correcting, logical process for the planning, development, and implementation of man-made entities. It provides a procedural framework within which the purpose of the system is first specified and then analyzed to find the best way to achieve it. On the basis of this analysis, the components that are most suitable to the successful performance of the system can be selected. It will ensure that appropriate components will be available at the proper time and will interact with other components as planned. Finally, continuous evaluation of the system oversees the implementation of the purpose and provides a basis for planned change in improving economy and performance.

Banathy's definition introduced the word system. A system is "an entity comprised of parts which is designed and built by man into an organized whole for the attainment of a specific purpose (Banathy, 1968, p.90). For example, in education systems should be built for one purpose--learning (Banathy, 1968; Roueche and Herrscher, 1970). Roueche and Snow added that research indicated that in the community college the most appropriate system for improving student achievement, retention, and attitudes was an individual learner-oriented instructional system.

To design a learner-oriented instructional system, Banathy

(1968, p.29) suggested:

1. Formulate a statement that spells out what we expect the learner to do, know, and feel (Formulate Objectives).

2. Develop a test based on the objectives and use it to test terminal proficiency (Develop Test).

3. Find out what has to be learned by the student so that he can behave in the way described by the objectives. In this analysis, the learner does not have to learn whatever he already knows (Analysis of Learning Task).

4. Consider alternatives and identify what has to be done to ensure that the learner will master the tasks (Functions Analysis). Determine who or what has the best potential to accomplish these functions (Component Analysis). Decide when and where the functions are to be carried out (Design of the System).

5. The designed system can now be tried out or tested, implemented, and installed. The performance of the learner is to be evaluated in order to assess the degree to which he behaves in the way initially designed (Implement and Test Output).

6. Findings of the evaluation are fed back into the system to see what changes--if any--are needed to improve the system (Change to Improve).

Herrscher (1973) designed a systematic approach to instruction based on the writings of Bela Banathy, Ralph Tyler, W. James Popham, and Jerrold Kemp. Herrscher (1973, p.17) stressed that "the system is not a teaching methodology, but a rational framework into which any mode of instruction will fit." He added that anyone concerned with instruction should understand the system since it is the key to increased instructional efficiency and to providing sound, organized direction for instructional improvement.

The Herrscher system involved the following six steps:

1. Rationale - Students should be told why it is important that they master the given material.

2. Objectives - A statement(s) of what the learner will be able to do after instruction that he could not do before.

3. Pre-assessment - Designer must determine whether a student has the prerequisite background and capabilities to profit from instruction and/or the skills, attitudes, and knowledge specified in the objectives.

4. Learning Activities - The methods used to assist the student in mastering the objectives. These methods must include explicit directions, learning units of appropriate length, frequent practice, knowledge of results, positive reinforcement, and appropriate media (persons and materials).

5. Post-assessment - Measurable evidence that learning has (or has not) occurred. If no learning has occurred, the student must be recycled into the revised system until he/she demonstrates mastery.

6. Revision - The process of obtaining feedback from the learner. Data regarding error rate and interviews with the learner are two such sources.

According to Roueche and Pitman (1972) the Herrscher system was the most appropriate for community college instruction. However, they proposed two additions to this model. First, budgetary considerations should be added to the learning activities point. Secondly, they emphasized the need for revision of objectives. This process would make allowance for a case in which very few students met a given objective. In this case, instead of recycling the learner, the objective would be modified or eliminated.

The systems approach has a dual role in education: (1) it provides a framework for decision making and design development; and (2) it should bring about a clearer understanding of the purpose of education (Banathy, 1968, p.86).

It was mentioned in the beginning of this chapter that the initial step taken in designing a delivery system that would improve the achievement, retention, and attitudes of students enrolled in Mathematics 111 at Malcolm X College was to review the related literature. Based on this review, a systems approach was utilized to design a holistic instructional delivery system that was structured for student success, provided positive reinforcement, and was taught by a concerned instructor who believed that students can learn. Roueche and Snow (1977) and Roueche and Kirk (1973) supported this design. They stressed that an effective redemption program began with a teacher, dean or board of trustees taking seriously the notion that community colleges exist to facilitate learning. They insisted that all students can learn with the assistance of caring and skillful professors, nontraditional delivery systems, and well thought-out programs that unite institutional resources.

Chapter 3

PROCEDURES AND METHODOLOGY

A true experimental design was utilized in this study. This design was used because it provided completely adequate controls for all sources of internal validity (Tuckman, 1972, p.106).

Procedures for Collecting Data

The original study consisted of 70 students. Five were dropped because they did not pass an arithmetic performance test that was used to determine eligibility for registration in Mathematics 111. Four were officially withdrawn from the class because they did not attend at least one of the first six class sessions. Thus, the final study consisted of 61 students enrolled in Mathematics 111 at Malcolm X College. They were randomly assigned to two out of a total of eight Mathematics 111 sections. The classes met at 9:00 a.m. and 10:00 a.m. on Monday, Wednesday, and Friday.

Kincaid's study (cited in Childers and Haas, 1970, p.21) offered the precedent by which college and university registration was relied upon to ensure that subjects were assigned on a random basis.. Registration was restricted to special days, and students chose their own classes. Also, each student wrote an arithmetic performance test, in which an item analysis was done to ensure content validity, to determine

if he or she should register for Mathematics 111 (knowledgeable) or Mathematics 103 (less knowledgeable). In that the college specifies a maximum of 35 students in 111 sections, no more than this was assigned to any class. Balance in the number of students in a section was sought, but no other attempts were made to distribute students by any standard.

The subjects were taught by one instructor, used identical written instructional materials, wrote the same unit examinations, and were provided with tutorial assistance. The experimental group, utilizing the holistic instructional approach, contained 32 students and was chosen by the flip of a coin. The control group was taught using the traditional method and contained 29 students. During the final examination week of an 18-week semester, a questionnaire was administered to the students in the control and experimental groups. At the end of the semester, achievement scores, retention rates, and questionnaire scores were computed and analyzed.

The questionnaire used in this study was a revised version of the Pennsylvania State University Instruction Attitude Inventory. The questionnaire included 43 out of the 47 items comprising the original attitude inventory. The original instrument was designed to assess students attitudes toward a specific period of instruction. The reliability of the Pennsylvania State University Instruction Attitude Inventory was .918 (Finch, 1969).

The questionnaire was constructed using a Likert scale.

This scale was used for respondents to register the extent of agreement or disagreement with a particular statement of an attitude. The respondents registered their opinions by circling the letter(s): SA (strongly agree), A (agree), N (neutral), D (disagree), or SD (strongly disagree). Responses were scored using the following keys: SA = 5, A = 4, N = 3, D = 2, SD = 1 for items written in a positive direction; and SD = 5, D = 4, N = 3, A = 2, SA = 1 for items written in a negative direction (Finch, Note 5).

Procedures for Treating Data

Two classes of Mathematics 111 students, 32 in the experimental group and 29 in the control group were used in this study. Since college and university registration ensured the unbiased assignment of subjects to conditions, the post-test only group design was used because it provided suitable controls for all sources of internal validity (Tuckman, 1972, p.107). Tuckman added that the appropriate technique of analysis for treating the data was to compare the mean score of the control group and the mean score of the experimental group. Based on Tuckman's recommendations, an independent Student *t*-test with $p = .05$ was used to test the first two hypotheses. In other words, an independent Student *t*-test was used to determine if there was a significant difference between the mean achievement scores (hypothesis 1) of the control and experimental groups. This test was also used to determine if there was a significant difference between the mean questionnaire scores

of the two groups.

To test the third hypothesis, which involved retention rates or the proportion of students retained in Mathematics 111, the z-test was used to test the significance of the difference between two sample proportions.

Instructional Procedures

In the section titled "Procedures for Collecting Data," it was stated that the students in both the control and experimental groups were taught by one instructor, used identical written instructional materials, wrote the same unit examinations, and were provided with tutorial assistance. In addition to these procedures the students in the experimental group were exposed to a holistic delivery system that was designed to improve retention and students' attitudes toward instruction by decreasing their feelings of inadequacy in mastering a series of learning tasks.

This delivery system was based on the works of Roueche et al. (1976), Roueche (1976a), Roueche and Snow (1977), and Roueche and Mink's (1976a) research that documented significant relationships between the time teachers were willing to spend early in the semester in getting involved with students and the amount of content these individuals mastered in the semester. The system structured student success by utilizing the following techniques:

1. Students received a detailed syllabus that explained what was expected of them and how their grade would be earned. The syllabus consisted of a list of course objectives with the desired proficiency levels, learning activities, and additional instructional resources.

2. The first week of class was an orientation in which no content (mathematics) was taught. Instead the instructor learned the name of each student and stressed the following points:

   a. All students will be graded solely on their performance on five unit examinations.
   b. Final grades will be based on an absolute grading system and not the performance of peers.
   c. Every student will be expected to earn a grade of "A", and the instructor will do everything humanly possible to assist in the fulfillment of that expectancy.

3. Students were given frequent non-graded formative evaluation quizzes to determine if they had mastered each unit objective at the desired level. If a student mastered an objective, his or her paper was marked "achieved competency" and recorded. If the student did not achieve competency, his or her paper was marked "recycle". In the latter case, the individual received as many opportunities as needed to achieve competency. However, a student could

not rewrite a quiz unless he or she first obtained tutorial assistance. It should be noted that there was no penalty for achieving competency after the first post-assessment, and ten points were added to the test scores of all students that mastered all the unit objectives before the examination covering the same material was administered. These ten points were not included in the computation of the achievement scores of the experimental group.

4. All initial unit examinations were worth 120 points and were graded using an absolute grading system. If a student did not pass a test, he or she was given the opportunity to recycle any problems not mastered on that examination. However, a unit examination that was recycled or was not written on the announced day it was given, was only worth 80 points. This policy was adopted to provide incentive for students to recycle exams and to curtail student procrastination. Once a student recycled any unit examination, the recycled exam was officially recorded, not the initial test score.

5. If students missed a class, they were called or mailed a card that informed them of any assignments or information missed. Under no circumstances were learners asked to explain why they were absent, but they were requested to make a commitment to return to school.

6. Each student was required to attend a weekly half-hour mathematics workshop consisting of five or six individuals. In these workshops, the instructor, a paraprofessional, and peer tutors identified and assisted individuals in achieving competency in any objectives or tests not mastered. All the tutors were former students of the instructor and were paid through a federally assisted work-study program. This procedure was chosen because it ensured that the tutor understood the instructor's methodology and the professor knew the tutor's capabilities. Also, the instructor attempted to develop a warm, caring, and trusting working relationship between himself, the tutors, and the paraprofessional (a member of the Learning Resource Center staff).

7. In addition to the weekly workshop, peer tutors were available in a designated room at particular hours to provide tutorial assistance. Students from both the experimental and control groups used this service. However, the individuals in the experimental group were personally sent or walked to a specific tutor, whereas, the learners in the control group were told that the service was available and it was their responsibility to seek out any tutor.

8. All lectures were recorded on video-cassettes. This technique was employed to allow students to review any lesson they missed or did not thoroughly understand.

9. A folder containing the results of the non-graded formative evaluation quizzes, unit test scores, class schedules,

days absent from class and workshops, and the student's phone number and address was maintained for each learner. These records were kept to assist the instructor in counseling and monitoring students' progress on a daily, weekly, and monthly basis.

10. The instructor interacted with students as much as possible outside the classroom. This interaction included:

a. Visiting students in the hospital.

b. Discussing topics besides mathematics with students in the workshop, cafeteria, or school corridors.

c. Making students aware of the fact that the teacher knew their names, grades, and any work or assignments not mastered without consulting a record book.

Chapter 4

FINDINGS

The findings of this study are presented and analyzed in this chapter. First, the experimental and control groups are compared on the basis of demographic characteristics. Each hypothesis listed in Chapter 1 is then examined. Next, the holistic instructional strategies are discussed in relationship to student achievement, attitudes, and retention.

Preliminary Comparison of Control and Experimental Groups

Two sections of Mathematics 111 students, 32 in the experimental group and 29 in the control group, were used in this research. The experimental group was instructed using the holistic approach and the control group was taught in the traditional manner.

The chief internal validity concern in the study was selection. To minimize selection invalidity, subjects were assigned to the control and experimental groups on a random basis. The randomization technique used was based on the research of Kincaid (cited in Childers and Haas, 1970) which offered the precedent where college registration procedures ensured that subjects were assigned on a random basis. Also, a post-assignment check was made on the students in the control and experimental groups demographic characteristics (see Table 1) to assure their equivalence and their eligibility to register for Mathematics 111.

Table 1

Demographic Characteristics of Experimental and Control Groups

Group	Age[a]		Placement Test Score[b]		Sex[c]		Ethnic Origin[d]			Financial Aid[e]		Employment Status[f]	
	$\bar{x}$	s	$\bar{x}$	s	%	%	%	%	%	%	%	%	%
					M	F	B	S	O	R	NR	E	U
Experimental	23	4.5	23	5.1	16	84	94	3	3	88	12	47	53
Control	25	6.5	21	6.2	38	62	92	4	4	72	28	31	69

Note. Experimental Group contained 32 students and the Control Group contained 29.

[a] $\bar{x}$ = Mean
s = Standard Deviation

[b] See Footnote a

[c] M = Male
F = Female

[d] B = Black
S = Spanish
O = Others

[e] R = Receiving
NR = Not Receiving

[f] E = Employed
U = Unemployed

Hypothesis One

The first null hypothesis tested was that students instructed in Mathematics 111 using a holistic instructional delivery system would not have significantly higher mean achievement scores than the group taught in the traditional manner. However,

the calculated t-value, t (59) = 2.81, p = .05, exceeded the table value of t = 1.67; therefore, the null hypothesis was rejected (see Table 2). Students instructed using the holistic approach earned significantly higher achievement scores than the group taught in the traditional manner.

Table 2

Comparison of Mean Achievement Scores of Experimental and Control Groups

Group	N	$\bar{X}$	s	df	t
Experimental	32	74.89	35.13	59	2.81*
Control	29	47.76	40.17		

* p = .05

Based on the results presented in Table 2, it appeared that a holistic instructional delivery system has positive effects on student achievement. The most effective strategies were teacher-student involvement, formative evaluation, and attendance at mandatory tutoring sessions.

One of the important components of the holistic approach was early and continuous involvement with students. The instructor facilitated this involvement using the following techniques:

1. No content (mathematics) was taught the first week of school. Instead, the instructor learned the name of

each student and lead a discussion on how an individual can achieve his or her goals. Also, the professor assured every student that he would do everything humanly possible to assist them in achieving these goals.

2. If students missed a class, they were called or mailed a card informing them of the assignments or information missed.

3. The six-phase Glaser Reality Therapy model was employed to correct any student behavior not conducive to learning. These behaviors included missing class or tutoring sessions, not completing homework assignments correctly, failing to recycle unit objectives or examinations, and taking sloppy or incomplete notes. In addition, actions that were conducive to learning were positively reinforced.

4. The instructor personally informed each student of his or her progress on a daily, weekly, and monthly basis directly after the class, during tutoring sessions, in the hallways, or by telephone.

The effectiveness of early involvement with learners supported the findings of Roueche and Mink (1976a). They found that there are significant relationships between the time teachers are willing to spend early in the semester working with students and the amount of content they mastered.

In Chapter 1, it was mentioned that non-graded formative evaluation quizzes were used to identify learning weaknesses prior to the completion of a unit of instruction. This form of evaluation was more than adequate because it helped students determine their strengths and weaknesses relative to the course objectives, and it assisted the teacher in prescribing learning objectives.

The formative evaluation quizzes were also effective because they were keyed to the homework and unit examinations. Thus, if learners did not achieve competency at the desired level on objective five, they knew they needed to restudy problem five of the homework in order to be able to correctly compute the solution to question five on the unit examination. The importance of formative evaluation was corroborated by Bloom, Hastings, and Madaus (1971). They argued that the success or failure of student learning was linked with the degree of efficiency of formative evaluation tests in pinpointing learning needs.

Formative evaluation was efficient in identifying learning needs. However, tutoring seemed to be the key to improving student achievement. The majority of the tutoring was done in the mathematics workshop by the instructor, peer tutors, and a paraprofessional. This technique was useful because:

1. Tutoring provided a great deal of student-teacher interaction outside the classroom since the instructor personally participated in every workshop.

In addition, the teacher used the results of the formative evaluation quizzes and the tutoring sessions to counsel students.

2. The tutoring sessions provided an informal and non-threatening environment in which the learner was informed of any additional opportunities in the event he or she did not achieve competency on the first post-assessment (recycling). In the case where a student had achieved all the objectives, the mathematics workshop was used to review what the learner already understood and to prepare the individual for the next class meeting.

It should be noted that all students were required to attend the mathematics workshop. This was done to ensure that the tutoring sessions were not thought of as punishment for individuals encountering learning difficulties and that the instructor would have the opportunity to talk at least once a week with students to show them that he cared about them as human beings--as well as their academic performance.

Although, the results of previous studies indicated contradictory findings on the effectiveness of tutoring in improving student achievement, the results of this research found that tutoring can help to raise student achievement levels when coupled with formative evaluation and a genuine concern for

helping individuals realize their academic potential without threat or embarassment. It also should be emphasized here that tutors were available to the students taught in the traditional manner (control group), but only two students ever visited the tutors and this was only the day before two of the five unit examinations. Thus, for tutoring sessions to be effective, they must be a mandatory class requirement.

Hypothesis Two

The second null hypothesis tested was that students instructed in Mathematics 111 using a holistic instructional delivery system would not have significantly higher positive attitudes toward instruction than those taught in the traditional manner. However, the calculated t-value, $t(46) = 2.79$, $p = .05$, exceeded the table value of $t = 1.68$; therefore, the null hypothesis was rejected (see Table 3). Students instructed using a holistic approach had significantly higher positive attitudes toward instruction than the group taught in the traditional manner.

Table 3

Comparison of Mean Questionnaire Scores of Experimental and Control Groups

Group	N	$\bar{X}$	s	df	t
Experimental	24	180.50	20.87	46	2.79*
Control	24	159.96	29.42		

* $p = .05$

The second hypothesis was formulated from Bloom's (1971) findings that students' attitude toward instruction was a perceptual phenomenom based on the judgements made of their adequacy to perform a particular learning task or series of learning tasks. These judgements were influenced by the school they attended, the marking system, and the learning activities. In other words, to develop positive student attitudes toward instruction the instructional delivery system must decrease students' feelings of inadequacy in mastering course content. In this study, this was done by structuring student success, providing positive reinforcement when problems arose, and creating the proper environment for learning.

After analyzing the students' responses on the Pennsylvania State University Attitude Inventory, it was interesting to note that questions one, three, and forty-three (see Table 4) supported one of the instructor's major beliefs regarding holistic instruction. He believed that it was possible to design and implement a delivery system for traditionally unpopular courses in which a large percentage of the students wanted more instruction presented in this way, believed that the material was of value, and felt that someone cared whether they succeeded or not. After all, how meaningful can an education be if in the process of achieving competency in course objectives the learners disliked the method of instruction, felt the material was of no value, and thought the instructor

did not care one way or the other whether they gained competency in their work or not?

Table 4

Comparison of Experimental and Control Groups Responses to Questions One, Three, and Forty-Three on the Instruction Attitude Inventory

Question	Experimental Group					Control Group				
	% SD	% D	% N	% A	% SA	% SD	% D	% N	% A	% SA
1. I would like more instruction presented in this way.	0	0	8	46	46	12	7	11	33	37
3. The material presented was of much value to me.	0	0	0	17	83	12	4	7	44	33
43. I felt no one really cared whether I worked or not.	71	29	0	0	0	41	37	7	11	4

Note. SD = strongly disagree
D = disagree
N = neutral
A = agree
SA = strongly agree

Hypothesis Three

The third null hypothesis tested was that students in Mathematics 111 instructed using a holistic instructional delivery system would not have a significantly higher rate of retention than those taught in the traditional manner. In this case, the calculated z-value, $z = 1.09$, $p = .05$ did not exceed the table value of $z = 1.64$; thus the null hypothesis was not rejected (see Table 5).

Table 5

Comparison of Experimental and Control Groups Rate of Retention

Group	N	P [a]	Z
Experimental	32	.69	1.09*
Control	29	.55	

[a] P = proportion of students retained

*p = .05

The findings of no statistically significant difference between the retention rates of the group instructed using the holistic approach (experimental) and the one taught in the traditional manner (control) appeared to contradict the hypothesis that the experimental group would have a significantly higher rate of retention. It also seems to contradict the research of Adams (1971), Born and Herbert (1971), MacMillan (1971), Sykes (1971), Yuthas (1971), and Carman (1975) which documented that students participating in a formal tutoring program had significantly higher rates of retention than individuals not enrolled in the program. However, of the ten students not retained in the experimental group, seventy per cent were receiving passing grades before they unofficially withdrew or began a sporadic attendance pattern. On the other hand, of the thirteen students not retained in the control group, only seven per cent were passing when they unofficially withdrew or began a sporadic attendance pattern. When one considers these statistics, it appears that several other factors influenced the results reported in Table 5.

The first factor was financial aid. During the 14th week of an 18-week semester, five of the ten (50%) students not retained in the experimental group suddenly stopped attending class or began a very irregular attendance pattern (this pattern was not evident in the control group). All five of these students were passing the course, had attended class regularly for 14 weeks, and were receiving the Basic Educational Opportunity Grant (BEOG). On the basis of the aforementioned statements and the fact that the last BEOG check was disbursed during the 13th week of school, these students probably were enrolled just to get a BEOG check and no form of instruction could succeed in retaining them.

The second factor was the amount of personal problems encountered by students in the experimental group. When the instructor contacted these individuals he found the problems included family deaths, pregnancy, loss of jobs, home evictions, and major family or personal illnesses. Although the members of the control group who unofficially withdrew probably probably experienced these same problems, it was difficult to determine whether they dropped out for personal reasons or because they were failing (only seven per cent were passing). Whereas, seventy per cent of the learners in the experimental group were passing when they withdrew. Based on this information and Roueche's (Note 6) research which indicated that most students withdraw from community colleges because of poor academic achievement even though they said it was for other

reasons, it is probably safe to assume that the students in the control group not retained withdrew because they were failing and that the students in the experimental group dropped out due to legitimate personal reasons. Also note here that 94 per cent of the students in the experimental group persisted until mid-term with no student absent more than four days. While only 65% of the members of the control group met the same criteria.

The final factor was inconsistency in the meaning of the word retention. Recall, the results of several studies indicated that participation in a formal tutoring program (a major strategy in this study) significantly increased student retention. In these investigations, a definition of retention was not given or it was so vague that a student could have missed four weeks of class and still would have met the criteria for retention. The point being made here is that using the conditions for retention utilized in previous studies, the instructor could have reported a significant difference in the retention rates of the experimental and control groups.

Relationship Between Holistic Instructional Strategies

A systems approach was used to develop the holistic instructional delivery system utilized in this study. The development of the system was based on the writings of Roueche and Pitman (1972). They suggested the six-phase instruction-

al system designed by Herrscher (1973) incorporated with budgetary considerations and a procedure for revising the original objectives was the most suitable for the community college.

In designing this system, the instructor was convinced that by decreasing students' feelings of inadequacy in mastering a series of learning tasks their attitudes toward instruction would improve. Then the combination of increased achievement scores and positive attitudes toward instruction would be reflected in a high student retention rate. While the latter was not achieved, it was interesting to note the relationships between the instructional strategies (formative evaluation, tutoring, and creating the proper learning environment) and their effects on the findings reported in this chapter.

The teacher originally thought a single instructional technique had a greater impact on the results of this investigation. However, after reviewing and discussing the findings with colleagues, students, and the tutors employed in the study, it was evident that one strategy would probably be ineffective without the other two. For example, tutoring was an essential component of this holistic design; but without the formative evaluation quizzes to identify students' learning difficulties and the daily displays of caring about students as human beings, tutoring would be ineffective. In the same sense, no matter how much the professor called, wrote, and touched students, if he could not determine students' learning weaknesses and

prescribe the proper correctives, the results probably would have been that learners would think the instructor was a nice man who did very little to improve their academic skills and attitudes toward instruction.

On the basis of the findings and the discussions with all the individuals participating in the design, implementation, and evaluation of this study, no single learning activity is adequate to accommodate the individual differences in students' academic abilities and attitudes found in the community college classroom. However, an instructor can accommodate these differences by caring enough about the growth of students to systemically design, implement, and evaluate an holistic instructional delivery system capable of significantly increasing learners' achievement, attitudes and retention.

The following suggestions can help the professor accomplish this:

1. The first week of the semester should be an orientation with no content taught. During this week, the instructor should (a) learn the name of each student, (b) check to see that all students have satisfied the prerequisites of the course, and (c) explain what will be expected of the student and that the instructor will do everything humanly possible to assist them in the fulfillment of that expectancy.

2. Non-graded formative evaluation quizzes which are keyed to unit test items and homework problems are useful in identifying learning strengths and weaknesses.

3. Many learning activities are essential. These should include individual and group tutoring, copies of lecture notes and sample tests placed in the library, video-cassettes (of classroom lectures) and/or any activities the individual student feels is helpful.

4. Although students should choose some of their learning activities, they must be given very little choice in whether or not to participate in the activities. This is based on the instructor's belief that community college students, and people in general, would rather be told what to do; and if given an opportunity not to perform a task requiring some effort, most would choose to avoid the task. Also, individuals will not say "no" to anything if it is presented in a logical, non-threatening, and pleasant manner by someone whom they respect, care about, or who is showing some concern for their welfare, and it is not in conflict with a previous commitment or their sense of right and wrong.

In relationship to teaching in the community college, the implication is that professors must carefully guide learners in their daily, weekly, and monthly learning activities. In other words, students should not be asked to make an appointment to talk with the instructor

when they have a problem. Instead, the teacher must have a copy of each student's class schedule and working hours in order to determine when the student is available for consultation. The teacher should then tell the student when and where they will meet, what will be discussed and why; and if for any reason there is a conflict, a commitment by both parties is made to meet at another time. In addition, students should not be sent to a counselor, tutor, or any other individual to help them with a problem. They must be personally introduced to them to ensure that nothing or no one prevents the learner from obtaining the desired information.

5. If tutoring sessions or mathematics workshops are used as a learning activity, every student should be required to attend. This avoids tutoring or any form of extra work from being designated for the so-called "bad" student. Also, tutoring sessions provide the instructor an opportunity to counsel and interact with students.

6. Class attendance should never be optional. Learners must be required to attend class or to maintain some type of regular hours for taking part in the learning activities. In the event a student is absent, he or she must be called, visited, or informed by mail of what assignments or information was missed.

They should not have to explain why they were absent, but they should be asked when they will return to school. If the student cannot return to class immediately, provisions should be made for the individual to receive or review any materials missed.

The question now is, will this delivery system make the learner too dependent? It probably will, but initially students need this kind of support to assure them that someone cares and will help them overcome any obstacles. Nevertheless, the learners should and can be assisted in making independent decisions by the instructor constantly emphasizing that their successes (or failures) are due to their efforts--not the instructor's. After all, at some point in everyone's life they were dependent on someone to help them accomplish a goal and their ability to later make independent decisions was not hampered. In fact, this type of relationship may help individuals set higher or more ambitious goals.

Chapter 5

SUMMARY AND CONCLUSIONS

This chapter contains the summary of the findings, overall conclusions from the study, recommendations, and strategies for diffusion, implementation, and change. The summary contains a review of the study and the major findings. The conclusions are based on the findings reported in Chapter four. The recommendations were derived from the findings and conclusions. Lastly, the strategies for diffusion, implementation, and change were influenced by discussions with interested colleagues and concerned students.

Summary of Findings

The purpose of this study was to design, implement, and evaluate a holistic instructional delivery system that would significantly increase the achievement scores, rates of retention, and positive attitudes toward instruction of students enrolled in Mathematics 111 at Malcolm X College. The study was conducted Spring semester 1978 with two sections of Mathematics 111 students, 32 in the experimental group and 29 in the control group. The experimental group was instructed using the holistic approach and the control group was taught in the traditional manner. During the final examination week of an 18-week semester, a question-

naire (see Appendix) which assessed students' attitudes toward a specific period of instruction was administered to both the control and experimental groups. At the end of the semester, learners' achievement scores and questionnaire scores were computed and analyzed using an independent Student t-test. Also, a z-test was employed to test the significance of the difference between the proportion of students retained in the two groups.

The holistic instructional delivery system included several features designed to decrease students' feelings of inadequacy in mastering a series of learning tasks and improve their attitudes toward instruction. These features were formative evaluation, mandatory attendance at a mathematics workshop, and creating the proper environment for learning.

Non-graded formative evaluation quizzes were given on all the course objectives to assist both the instructor and student in identifying the student's learning weaknesses and strengths. In order to correct these weaknesses and to positively reinforce what students understood, all learners participated in a weekly mathematics workshop in which the instructor and peer tutors assisted individuals in achieving competency in the course objectives. In addition, throughout the semester students were constantly reminded and shown that the instructor would do everything humanly possible to help them achieve their educational goals.

Hypotheses

To fulfill the purposes of this investigation, the following null hypotheses were tested:

1. Students instructed using a holistic instructional delivery system would not have significantly higher mean achievement scores than the group taught in the traditional manner.

2. Students instructed in Mathematics 111 using a holistic instructional delivery system would not have significantly higher positive attitudes toward instruction than the group taught in the traditional manner.

3. Students instructed using a holistic instructional delivery system would not have a significantly higher rate of retention than the group taught in the traditional manner.

The first null hypothesis was rejected at the .05 level of significance. Students instructed using a holistic approach (experimental group) earned significantly higher achievement scores than those taught in the traditional manner (control group). The mean achievement scores for the experimental and control groups were 74.89 and 47.76 respectively.

The second null hypothesis was also rejected at the .05 level of significance. Students instructed using a holistic approach had significantly higher positive attitudes toward instruction than the group taught in the traditional manner. The mean questionnaire scores were 180.50 for members of the experimental group and 159.96 for individuals in the control group.

The third null hypothesis was not rejected. Statistically, there was no difference in the proportion of students retained in the experimental and control groups. In this case, it appeared that the results were influenced by the large percentage of students receiving financial aid and/or the abnormal amount of personal problems encountered by the individuals in the experimental group.

One interesting outcome from the research was a very high percentage of the students instructed using the holistic approach enjoyed the way the course was taught, felt the material was of much value, and believed that someone cared whether they achieved competency in mathematics or not. This outcome was probably due to the combination of a well-designed course and the warm, trusting, and caring relationship developed between the instructor, tutors, and students.

During the development and implementation of the holistic delivery system, two problems arose that are worthy of comment. The most crucial problem was the

amount of time the instructor spent preparing and organizing materials and learning activities. These materials and activities included writing behavioral objectives, producing three variations of each formative evaluation quiz and unit examinations, placing copies of lecture notes in the library, recording video-cassettes of classroom lectures, training tutors as well as maintaining time sheets for tutors, calling and writing students, and monitoring students progress on a daily, weekly, and monthly basis. Also, time must be spent in group and individual tutoring sessions.

These problems can be solved by a department or group of concerned faculty members working together. For example, each member of the department could design and assume the responsibility for organizing a phase of the system. Also, additional peer tutors or members of the Learning Resource Center could maintain records and tutor students.

The second problem arises as a result of the number of students entering the community college with negative attitudes toward mathematics and thinking that only the "chosen few" can master mathematics. In this situation, the teacher's expectations of students' chances of success becomes a very powerful motivational tool. In other words, if the instructor does not believe in and care about his students, a holistic approach to instruction will probably be ineffective. However, the instructor who accepts this

teaching strategy or philosophy must be aware that students will expect more of and from them than professors utilizing a traditional approach; but, in return, students work harder and are more supportive and appreciative of the teacher's efforts to facilitate learning.

Conclusions

To the extent that the findings of this study are valid, the following conclusions are justified:

1. Students instructed using a holistic approach earn significantly higher grades than individuals taught in the traditional manner. The major effect of holistic instructional strategies appear to be in raising learner's achievement levels.

2. Students instructed using a holistic approach have significantly higher positive attitudes toward instruction than individuals taught in the traditional manner. It appears that by decreasing learner's feelings of inadequacy in mastering a subject, their attitudes toward instruction improve.

3. There is no statistically significant difference in the retention rates of students instructed using a holistic approach and individuals taught in a traditional manner.

4. A holistic instructional delivery system increases student-teacher interaction which in turn has positive effects on students' achievement scores and attitudes toward instruction.

5. Students prefer to be guided in their daily, weekly, and monthly learning activities. Under these conditions, students will participate (or make arrangements to participate) in the learning activities as long as they understand the purpose of the activity and the instructor's concern for their welfare.

6. Students instructed utilizing a holistic approach would like more courses taught in a similar manner, believed the course was valuable, and felt someone cared whether they succeeded or not.

7. No single instructional strategy or learning activity will accommodate the individual differences in academic abilities and attitudes of students. However, the combination of non-graded formative evaluation quizzes, mandatory tutoring sessions, and creating the proper environment for learners can be used to accommodate these differences.

8. If individual or group tutoring sessions are used as a learning activity, each student should be required to attend these sessions. This will ensure

that tutoring is not thought of as punishment for individuals encountering learning problems. In the case where students have achieved competency in the unit objectives, the tutoring sessions can be used to review the material covered to that point and/or counsel students.

9. Students progress must be monitored on a daily, weekly, and monthly basis. Since many students feel that only the "chosen few" can master mathematics, it is essential that the instructor knows each student's strengths and weaknesses in order to provide the necessary support, encouragement, and counseling when it is appropriate.

In general, students instructed in an introductory mathematics course using a holistic instructional delivery system are more likely to earn significantly higher achievement scores, develop significantly higher positive attitudes toward instruction, enjoy the manner in which the course was taught, believe the course is of much value, and feel that someone cares whether they master mathematics or not, than students taught in the traditional manner.

Recommendations

On the basis of the findings and conclusions of this study, the following recommendations are made:

1. The study should be reviewed, discussed, and evaluated by the mathematics department to determine methods of improving the design and evaluation of Mathematics 111. The design should address both the cognitive and affective needs of students with varying skills and attitudes towards mathematics instruction.

2. Non-graded formative evaluation quizzes, mandatory tutoring sessions, and/or creating the proper learning environment for students should be considered as potentially valuable components in the design of instruction for community college students.

3. Further research should be conducted to determine the effects of holistic instructional strategies in raising the academic achievement levels and attitudes toward instruction of students in the courses during and after the semester in which they were taught using the holistic approach in Mathematics 111. In particular, answers should be sought to the following questions:

   a. Will students successfully completing the Mathematics 111 course taught using a holistic approach enroll at a significantly higher rate in a more advanced mathematics course than those individuals who were instructed in the traditional manner?

b. For those individuals who enrolled in a more advanced mathematics course, was the mean grade received significantly related to their exposure to holistic instruction in Mathematics 111?

c. Will the grade point averages of students who were instructed using the holistic approach be significantly higher than individuals taught in the traditional manner?

4. Additional research is needed on the tutoring process and the characteristics of an effective tutor.

5. Research should be performed to determine if there is any significant difference in the achievement scores, rates of retention, and attitudes toward instruction of students instructed using the holistic approach and individuals taught using a modified holistic approach. In the modified holistic approach, the instructor would not participate in the tutoring sessions.

6. Further research should be conducted on the effects of holistic instruction as related to sex, age, ethnic or racial background, socio-economic background, personality variables, initial attitudes

toward instruction, varying levels of academic ability, and different grade levels.

7. In order to become more individualized, the holistic approach could be revised to provide students with more choices in behavioral objectives, instructional resources, levels of mastery, and forms of evaluation.

8. In order to increase both internal and external validity, the experiment should be replicated not only in mathematics but in other academic and occupational areas with varying populations.

9. Since the successful implementation of a holistic learning model depends on the time available and the desire of the instructor to accommodate individual differences in students' academic skills and attitudes toward instruction, research should be conducted on the effects of the learning model with different types of instructors. Perhaps this type of research would provide information concerning the instructional delivery system most effective for a particular kind of instructor.

Having summarized the findings, reported the conclusions, and made recommendations for the improvement of community college instruction based on the findings and conclusions, the last topic of discussion will be strategies for diffusion,

implementation and change utilizating the learning model designed in this investigation.

Strategies for Diffusion, Implementation, and Change

The primary reason for conducting this research was to provide information that could assist the mathematics department at Malcolm X College in redesigning Mathematics 111. To accomplish this goal, the need for holistic instruction and the results of this study will be discussed with each member of the mathematics faculty. The results will also be presented to the appropriate administrators, the mathematics curriculum development committee, interested colleagues, administrators, classified staff, and members of the Board of Trustees of the Chicago City Colleges. In addition, a copy of the completed study will be placed on reserve in the Malcolm X College library.

Another reason for conducting this research was to improve educational practices in general. In this case, the completed study will be submitted to the ERIC Clearinghouse for Junior Colleges. In addition, several articles discussing the various aspects of this investigation will be submitted to the Community and Junior College Journal and Improving College and University Teaching. Community college instructors and anyone else who expresses an interest in holistic instruction will receive copies of whatever information is desired.

In the process of designing, implementing, and evaluating a holistic instructional delivery system, several members of the mathematics department have shown a great deal of interest in the concept of holistic instruction and the results of this study. These individuals have indicated that they will implement and evaluate some of the instructional strategies and learning activities utilized in this study. At this point, no one has made a commitment to implement the entire system because of the time an instructor must devote to tutoring students. However, to eliminate this problem, the instructor who taught the control and experimental groups in this study will design, implement, evaluate, and teach a course in the Fall of 1978 to train tutors to assist instructors in Mathematics 111 courses at the college.

It is hoped that the results of this study and the discussion of these results will help community college instructors realize that if attending a community college is to be a meaningful educational experience for students, an effective, caring, well-informed, and capable teaching staff is essential. Since a number of students enroll in community colleges with negative attitudes toward instruction, it is the responsibility of the college to assist these students in developing the basic skills and attitudes needed to facilitate their academic and personal growth.

Colleges should be accountable for student learning

and development. The faculty and administrators must be concerned with developing innovative strategies to improve instruction and student attitudes. Colleges cannot totally depend on the universities to develop effective models for learning. Instructors must design, implement, and evaluate nontraditional instructional delivery systems to facilitate student learning. They must make every effort to ensure that the "open door" is not a "revolving door" for students. They must believe that students can learn if given enough time and direction.

REFERENCE NOTES

1. Cobb, E.S. A report on the teaching apprenticeship of instruction. Unpublished report, Barnard College, 1970.

2. Gallup, H.F. Individualized instruction in an introductory psychology course. Paper presented at the 41st annual meeting of the Eastern Psychological Association, Atlantic City, N.J., April, 1970.

3. Mink, O.G. & Watts, G.E. Reality therapy and personalized instruction: A success story. Unpublished report, University of Texas at Austin, 1975.

4. Bloom, B.S. Individual differences in school achievement: A vanishing point? Paper presented at the American Educational Research Association Convention, New York, February 4-7, 1971.

5. Finch, C.R. Personal communication, May 1977.

6. Roueche, J.E. Talk delivered to Nova University Seminar, Fort Lauderdale, Florida, 1977.

REFERENCES

Adams, W.R. Tutors and the reading lab. Western College Reading Association Newsletter, Spring 1971, 3.

Aiken, L.R., Jr. Attitudes toward mathematics. Review of Educational Research, October 1970, 40 (4), 551-96.

Aiken, L.R., & Dreger, R.M. The effect of attitudes on performance in mathematics. Journal of Educational Psychology, 1961, 52, 19-24.

Airasian, P.W. Formative evaluation instruments and validation of tests to evaluate learning over short periods of time. Unpublished doctoral dissertation, University of Chicago, 1969.

Airasian, P.W. The role of evaluation in mastery learning. In J.H. Block (Ed.), Mastery learning: Theory and practice. New York: Holt, Rinehardt, and Winston, 1971.

Alvord, D.J. Achievement and attitude. Science Teacher, April, 1972, 34, 36-38.

Atkinson, J.W., & Feather, N.T. (Eds.). A theory of achievement motivation. New York: John Wiley & Sons, 1966.

Banathy, B.H. Instructional systems. Palo Alto, California: Fearon Publisher, 1968.

Bednar, R.L., & Weinberg, S.L. Ingredients of successful treatment programs for underachievers. Journal of Counseling Psychology, 1970, 17, 1-7.

Block, J.H.(Ed.). Mastery learning: Theory and practice. New York: Holt, Rinehardt, and Winston, 1971.

Bloom, B.S. Learning for mastery. Evaluation Comment, May, 1968, 1 (2), 1-11.

Bloom, B.S. Affective consequences of school achievement. In J.H. Block (Ed.), Mastery learning: Theory and practice. New York: Holt, Rinehardt, and Winston, 1971.

Bloom, B.S. An introduction to mastery learning theory. In J.H. Block (Ed.), Schools, society, and mastery learning. New York: Holt, Rinehardt, and Winston, 1974.

Bloom, B.S., Hastings, J.T., & Madaus, G.F. Handbook on formative and summative evaluation of student learning. New York: McGraw-Hill Book Co., 1971.

Bormuth, J.R. On the theory of achievement test items. Chicago: University of Chicago Press, 1970.

Born, D.G., & Herbert, E.W. Further study of personalized instruction for students in large university classes. Journal of Experimental Education, Fall 1971, 40, 6-11.

Canfield, A.A. Two years on the road. In B.L. Johnson (Ed.), The experimental junior college. Los Angeles: University of California, 1968.

Carman, R.A. The effects of tutoring in developmental mathematics on the academic performance, attrition, and attitudes of community college students. Unpublished doctoral dissertation, University of California at Los Angeles, 1975.

Carroll, J. A model for school learning. Teachers Record, 1963, 64, 723-33.

Centra, J., & Rock, D. College environments and student academic achievement. American Educational Research Journal, 1971, 8, 623-24.

Childer, P.R. & Haas, V.J. Effects of detailed guidance on the writing efficiency of college freshmen. Journal of Experimental Education, 1970, 39, 20-23.

Cross, K.P. Accent on learning: Improving instruction and reshaping the curriculum. San Francisco: Jossey-Bass, 1976.

Dua, P.S. Comparison of the effects of behaviorally oriented action and psychotherapy reeducation on introversion, emotionality, and internal-external control. Journal of Counseling Psychology, 1970, 17, 567-72.

Evans, J. Free access: What it takes. Change, March 1974, 53-54.

Finch, C.R. An instrument to assess student attitude toward instruction. Journal of Educational Measurement, 1969, 6 (4), 257-58.

Glaser, R., & Nitko, A.J. Measurement in learning and instruction. Pittsburgh: University of Pittsburgh, Research and Development, 1970.

Glaser, W.L. The identity society. New York: Harper, 1972.

Gordon, E.W., & Wilkerson, D. Compensatory education for the disadvantaged. New York: College Entrance Examination Board, 1966.

Hecht, E. Guidance program for a ghetto school. Personnel and Guidance Journal, 1970, 48, 731-38.

Herrscher, B.R. A systematic approach to instruction. In J.E. Roueche & B.R. Herrscher (Eds.), Toward instructional accountability: A practical guide to educational change. Palo Alto, California: Westinghouse Learning Press, 1973.

Lee, G.E. A comparative study of the persistence and academic achievement of "Project 60" & regularly enrolled students at Middlesex Community College. Bedford Massachusetts: Middlesex Community College, 1974. (ERIC Document Reproduction Service No. ED 100481)

Lessing, E.E. Racial differences in indices of ego functions relevant to academic achievement. Journal of Genetic Psychology, 1969, 115, 153-67.

Lucas, J.A., Gaither, G.H., & Montgomery, J.R. Evaluating a tutorial program containing volunteer subjects. Journal of Experimental Education, Spring 1968, 36 (3), 78-81.

MacMillan, T.F. An evaluation of extended opportunity services at Santa Barbara City College (Research Report No. 6-72). Santa Barbara, California, April 1971.

Majumder, R.K., Friedland, B.V., Greever, K.B., & Holt, P.R. Counseling techniques tested. Journal of Rehabilitation, September-October, 1973, 39, 19-22.

Masters, J.C. Treatment of adolescent rebellion by the reconstrual of stimuli. Journal of Consulting and Clinical Psychology, 1970, 35(2), 213-16.

McGhee, P.E. & Crandall, V.C. Beliefs in internal-external control of reinforcements and academic performance. Child Development 1968, 39, 91-102.

McMichael, J.S., & Corey, J.R. Contingent management in an introductory psychology course produces better learning. Journal of Applied Behavioral Analysis, 1969, 2, 79-83.

Medsker, L.L. & Tillery, D. Breaking the access barriers: A profile of two-year colleges. New York: McGraw-Hill, 1971.

Mink, O.G. Internality approach to organizing learning groups in the community college classroom. Austin, Texas: University of Texas at Austin, 1976.

Mink, O.G. & Roueche, J.E. Counseling for internality. Austin, Texas: University of Texas at Austin, 1976.

Mink, O.G. & Watts, G.E. Reality therapy and personalized instruction: A success story. Community/Junior College Research Quarterly, July, September 1977, 1, 389-96.

Moore, W., Jr. Against the odds. San Francisco: Jossey-Bass, 1970.

Moore, W., Jr. Community college response to the high-risk student: A critical reappraisal. Washington, D.C.: American Association of Community and Junior Colleges, 1976.

Moos, R.H. The human context. New York: John Wiley & Sons, 1976.

Nowicki, S., Jr. & Roundtree, J. Correlates of locus of control in secondary school age students. Developmental Psychology, 1971, 4, 477-78.

O'Banion, T. & Thurston, A. Student development programs in the community college. Englewood Cliffs, New Jersey: Prentice-Hall, 1972.

Ostrowski, M.V. The behavioral objectives delivery system: Development and evaluative comparison to the traditional lecture method in child psychology. Unpublished doctoral dissertation, Nova University, 1976.

Pace, C.R. Implications of differences in campus atmosphere. In R.L. Sutherland (Ed.), Personality factors on the college campus. Austin, Texas: Hogg Foundation for Mental Health, 1962.

Richardson, R.C., Blocker, C.E. & Bender, L.W. Governance for the two-year college. Englewood Cliffs, New Jersey: Prentice-Hall Inc., 1972.

Rosenthal, R. The self-fulfilling prophecy. Psychology Today, 1968, 2, 44-51.

Rosenthal, R. & Jacobson, L. Pygmalion in the classroom. New York: Holt, 1968.

Rotter, J. Generalized expectancies for internal vs. external control of reinforcement. Psychological Monographs, 1966, 80, 1-28.

Roueche, J.E. Salvage, redirection, or custody? Remedial education in the community college. Washington, D.C.: American Association of Community and Junior Colleges, 1968.

Roueche, J.E. Accommodating individual differences. Community College Review, July-August 1973, 1, 24-30.

Roueche, J.E. Creating an environment for learning. Community and Junior College Journal, 1976, 46, 48-50.(a)

Roueche, J.E. Feeling good about yourself: What is good remedial education? Community College Frontiers, Winter 1976, 46, 48-50. (b)

Roueche, J.E., & Herrscher, B.R. A learning system of instruction. Junior College Journal, October 1970, 41, 22-26.

Roueche, J.E., Herrscher, B.R., & Baker, G.A. Time as the variable, achievement as the constant: Competency-based instruction in the community college. Washington, D.C.: American Association of Community and Junior Colleges, 1976.

Roueche, J.E., & Kirk, R.W. Catching up: Remedial education. San Francisco: Jossey-Bass, 1973.

Roueche, J.E., & Mink, O.G. The impact of instruction and counseling on high risk youth: Final report. Austin, Texas: University of Texas, Community College Leadership Program, 1976. (a)

Roueche, J.E., & Mink, O.G. Improving student motivation (A self-learning unit). Austin, Texas: Sterling Swift, 1976.(b)

Roueche, J.E., & Pitman, J.C. A modest proposal: Students can learn. San Francisco: Jossey-Bass, 1972.

Roueche, J.E. & Roueche, S.D. Developmental education: A primer for program development and evaluation. Atlanta, Georgia: Southern Regional Education Board, 1977.

Roueche, J.E., & Snow, J.J. Overcoming learning problems. San Francisco: Jossey-Bass, 1972.

Roueche, J.E., & Wheeler, C.L. Instructional procedures for the disadvantaged. Improving College and University Teaching. Summer 1973, 21, 222-25.

Sheppard, W.C., & MacDermet, H.J. Design and evaluation of a programmed course in introductory psychology. Journal of Applied Behavioral Analysis, 1970, 3, 5-11.

Snow, J., & Linquist, A. What works and what doesn't in community college developmental studies program. Austin, Texas: Community College Leadership Program University of Texas at Austin, March 1977.

Sykes, A.B. The effect of tutoring, reading instruction, and financial stipends upon student achievement, attrition, and attitudes at Compton College. Unpublished doctoral dissertation, University of California at Los Angeles, 1971.

Tavris, C. Compensatory education: The glass is half full. Psychology Today, 1976, 10 (4), 63-74.

Taylor, R.G. Tutorial services and academic success. Journal of Educational Research, January 1969, 62 (5), 195-97.

Thistlewaite, D. College environments and the development of talent. Science, 1959, 130, 71-76.

Tillery, D. Variation and change in community college organization: A preliminary report. Berkeley, California: Center for Research and Development in Higher Education, 1970.

Tuckman, B.W. Conducting educational research. New York: Harcourt Brace Jovanich Inc., 1972.

Wallberg, H. Social environment as a mediator of classroom learning. Journal of Educational Psychology, 1969, 60, 443-48.

Watts, G.E. Research on counseling strategies for under achieving students. Austin, Texas: University of Texas at Austin, June 1974.

Wentling, T.L. Mastery versus non-mastery instruction with varying test item feedback treatments. Journal of Educational Psychology, 1973, 65 (1), 50-58.

Wilson, R.C., Gaff, J.G., Dienst, E., Wood, L., & Bavry, J.L. College professors and their impact on students. New York: John Wiley & Sons, 1975.

Wright, R.M. The effects of organized tutoring and advising by upperclassmen with predicted unsuccessful freshmen (Report No. BR-0-F-095). Washington, D.C.: National Center for Educational Research and Development, 1971.

Yuthas, L.J. Student tutors in a college remedial program. Journal of Reading, January 1971, 14, 231-34.

APPENDIX

QUESTIONNAIRE

Directions: Below are several statements about the period of instruction which you have just completed. Read each statement carefully and indicate how much you agree or disagree with it according to the following scale:

SD = strongly disagree D = disagree N = neutral

A = agree SA = strongly agree

1.	I would like more instruction presented in this way.	SD	D	N	A	SA
2.	This instruction was very boring.	SD	D	N	A	SA
3.	The material presented was of much value.	SD	D	N	A	SA
4.	The instruction was too specific.	SD	D	N	A	SA
5.	I was glad just to get through the material.	SD	D	N	A	SA
6.	The material will help me to solve problems.	SD	D	N	A	SA
7.	I can apply very little of the material which I learned to a practical situation.	SD	D	N	A	SA
8.	The material made me feel at ease.	SD	D	N	A	SA
9.	In view of the time allowed for learning, I felt that too much material was presented.	SD	D	N	A	SA
10.	I could pass an examination over the material which was presented.	SD	D	N	A	SA
11.	I became easily discouraged with this type of instruction.	SD	D	N	A	SA
12.	I was not sure how much I learned while taking this instruction.	SD	D	N	A	SA
13.	There are too many distractions with this method of instruction.	SD	D	N	A	SA
14.	The material which I learned will help me when I take more instruction in this area.	SD	D	N	A	SA

15. This instructional method did not seem to be any more valuable than regular classroom instruction. SD D N A SA

16. I felt that I wanted to do my best work while taking this instruction. SD D N A SA

17. This method of instruction makes learning too mechanical. SD D N A SA

18. The instruction has increased my ability to think. SD D N A SA

19. I had difficulty reading the written material that was used. SD D N A SA

20. I felt frustrated by the instructional situation. SD D N A SA

21. This is a poor way for me to learn skills. SD D N A SA

22. This method of instruction does not seem to be any better than other methods of instruction. SD D N A SA

23. I am interested in trying to find out more about the subject matter. SD D N A SA

24. It was hard for me to follow the order of this instruction. SD D N A SA

25. While taking this instruction I felt isolated and alone. SD D N A SA

26. I felt uncertain as to my performance in the instruction. SD D N A SA

27. There was enough time to learn the material that was presented. SD D N A SA

28. I don't like this instruction any better than other kinds I have had. SD D N A SA

29. The material presented was difficult to understand. SD D N A SA

30. This was a very good way to learn the material. SD D N A SA

31. I felt very uneasy while taking this instruction. SD D N A SA

32. The material presented seemed to fit in well with my previous knowledge of the subject. SD D N A SA

33.	This method of instruction was a poor use of my time.	SD	D	N	A	SA
34.	While taking this instruction I felt challenged to do my best work.	SD	D	N	A	SA
35.	I disliked the way that I was instructed.	SD	D	N	A	SA
36.	The instruction gave me facts and not just talk.	SD	D	N	A	SA
37.	I guessed at most of the answers to problems.	SD	D	N	A	SA
38.	Answers were given to the questions that I had about the material.	SD	D	N	A	SA
39.	I seemed to learn very slowly with this type of instruction.	SD	D	N	A	SA
40.	This type of instruction makes me want to work harder.	SD	D	N	A	SA
41.	I did not understand the material that was presented.	SD	D	N	A	SA
42.	I felt as if I had my own teacher while taking this instruction.	SD	D	N	A	SA
43.	I felt that no one really cared whether I worked or not.	SD	D	N	A	SA

UNIVERSITY OF CALIF.
LOS ANGELES

SEP 8 1978

CLEARINGHOUSE FOR
JUNIOR COLLEGES